Mr. Michael T. Davis WLPCS Calculus	Units 1.1, 1.2 & 1.3 Practice Quiz September 8, 2017

Name: Answers/Solutions

Directions: Try each problem without your calculator, then use your calculator ONLY IF you feel you have truly tried everything possible without your calculator.

1. Determine an equation of a line containing the points $(3,-5)$ and $(3,1)$.

$m = \frac{1-(-5)}{3-3} = \frac{6}{0}$ = undefined vertical line

$x = 3$ ✓

2. Line A has equation $y+10=\frac{-3}{5}(x-11)$. Line B contains the point $(-10,14)$ and is perpendicular to line A. Determine an equation for line B in general form (standard form).

slope of line B is $m = \frac{5}{3}$

$y-14 = \frac{5}{3}(x+10)$

$y-14 = \frac{5}{3}x + \frac{50}{3}$

$3y-42 = 5x+50$

$-5x+3y = 92$

3. Graph $4x-3y=-12$ (plot several points and draw your line neatly)

If $x=0$, we have $(0,y)$

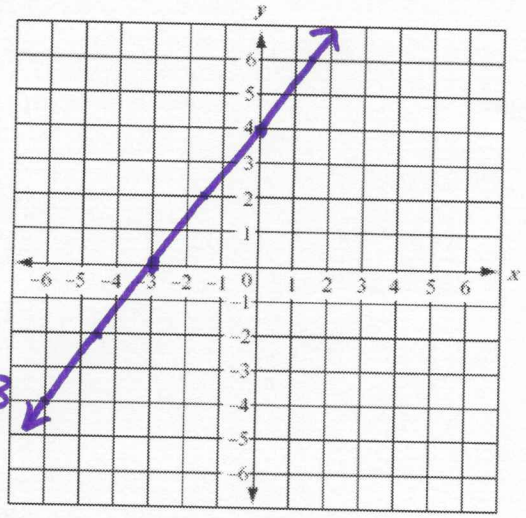
$4(0)-3y=-12$ $-3y=-12$ $y=4$

$(0,4)$

If $y=0$, we have $(x,0)$

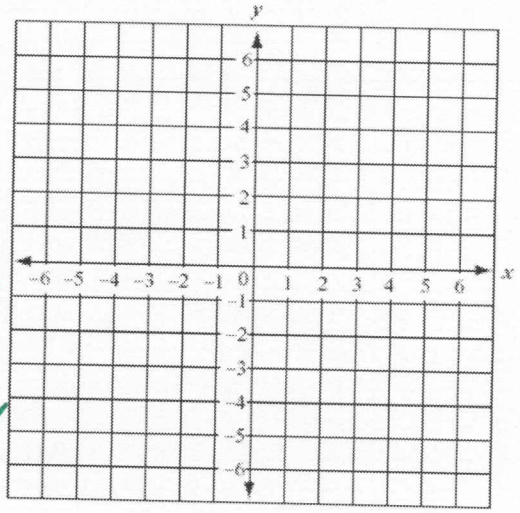
$4x-3(0)=-12$ $4x=-12$ $x=-3$

$(-3,0)$

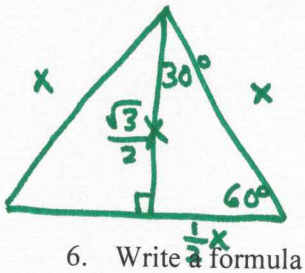


4. A line contains the points plotted below. Write an equation of the line in point-slope form, slope-intercept form, and general form (standard form).

I do not recall what line I drew



5. Write a formula for the height of an equilateral triangle as a function of its side length, x.



$h(x) = \frac{\sqrt{3}}{2}x$

6. Write a formula for the volume of a sphere as a function of the spere's radius, r.

$V(r) = \frac{4}{3}\pi r^3$

7. Identify the domain and range of the function $f(x) = 9 - x^2$.

D: $(-\infty, \infty)$

R: $(-\infty, 9]$

8. Identify the domain and range of the function $g(x) = \sqrt{5-x}$.

$5 - x \geq 0$

$-x \geq -5$

$x \leq 5$

D: $(-\infty, 5]$

R: $[0, \infty)$

9. Identify the domain and range of the function $k(x) = \sqrt{16 - x^2}$.

D: $[-4, 4]$

R: $[0, 4]$

$16 - x^2 \geq 0$

$x \geq -4$ and $x \leq 4$

$-4 \leq x \leq 4$

10. Identify the domain and range of the function $p(x) = \sqrt{-x}$.

D: $(-\infty, 0]$

R: $[0, \infty)$

11. Identify the domain and range of the function $h(x)=\sqrt[3]{x}$.

D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

12. Determine whether the function $f(x)=x^{\frac{1}{3}}$ is even, odd, or neither.

$f(x) = -f(-x)$ or $-f(x) = f(-x)$

example: $f(27)=3$ $f(-27)=-3$ $(27,3)$ & $(-27,-3)$

odd function

If (x,y) is on the graph, then so is $(-x,-y)$

13. Determine whether the function $g(x)=x^{\frac{2}{3}}$ is even, odd, or neither.

$f(8)=4$ $f(-8)=4$ $f(x)=f(-x)$

If (x,y) is on the graph, then so is $(-x,y)$

$(8,4)$ & $(-8,4)$ are on the graph

even function

14. Determine whether the function $k(x)=x^4-3x^2$ is even, odd, or neither.

$K(x) = K(-x)$

example: $K(2)=4$ & $K(-2)=4$

$(2,4)$ & $(-2,4)$ are on the graph

If (x,y) is on the graph, so is $(-x,y)$

Even Function

15. Determine whether the function $p(x)=\frac{1}{x}$ is even, odd, or neither.

$P(x) = -P(-x)$ or $-P(x) = P(-x)$

example: $P(2)=\frac{1}{2}$ & $P(-2)=-\frac{1}{2}$ $(2,\frac{1}{2})$ & $(-2,-\frac{1}{2})$

If (x,y) is on the graph, then so is $(-x,-y)$

Odd Function

16. Determine whether the function $m(x)=x^3-3x$ is even, odd, or neither.

$m(x) = -m(-x)$ or $-m(x) = m(-x)$

example: $m(3)=18$ & $m(-3)=-18$

$(3,18)$ & $(-3,-18)$ are both on the graph

If (x,y) is on the graph, then so is $(-x,-y)$

17. Given the piecewise function $f(x)=\begin{cases} x^2-1 \text{ if } x\le 2 \\ 2x-1 \text{ if } x>2 \end{cases}$, determine the following:

a. the value of $f(2)$ $(2)^2-1=3$

b. if the function is continuous at $x=2$

$(2)^2-1=3$ $2(2)-1=3$ yes, because both parts of the function equal 3 at the split at $x=2$

c. the domain of the function

$x\le 2$ or $x>2$ is the same as $(-\infty,\infty)$

D: $(-\infty,\infty)$

d. the range of the function

R: $[-1,\infty)$

18. Without a calculator, draw an approximate graph of each function:

a. $f(x)=e^x$ see attached page

b. $f(x)=e^{-x}$ reflection of $f(x)=e^x$ in the y-axis see attached page

c. $f(x)=e^x-3$ translation (shift) 3 units down see attached page

d. $f(x)=-e^x$ reflection of $f(x)=e^x$ in the x-axis see attached page

19. Use a graph on your calculator to find the zeros of the function $f(x)=3^x-7$

Method 1: $Y_1=3^X-7$ graph use "zero" in "calc" menu

Method 2: $y=3^x-7$ $0=3^x-7$ $3^x=7$ $\ln 3^x=\ln 7$

$x\ln 3=\ln 7$ $x=\frac{\ln 7}{\ln 3}$ $x\approx 1.771$

20. Determine the domain and range of the exponential function $f(x) = 2e^x + 3$

D: $(-\infty, \infty)$

R: $(3, \infty)$

21. The population of Silver Run in the year 1890 was 6250. Assume the population increased at a rate of 2.75% per year.

a. Estimate the population in 1915.

$A(t) = A_0(1 + 0.0275)^t$ where t = years since 1890

$A(25) = 6250(1.0275)^{25} \approx 12,314.76 \approx 12,315$ People

b. Approximate the year when the population reached 50,000.

$50000 = 6250(1.0275)^t$

$8 = 1.0275^t$

$\ln 8 = \ln 1.0275^t$

$\ln 8 = t \ln 1.0275$

$t = \dfrac{\ln 8}{\ln 1.0275}$

$t \approx 76.65$

$1890 + 77 = 1967$ approximately

22. Determine how much time is required for an investment to double in value if interest is earned at the rate of 6.25% compounded annually.

$A(t) = A_0(1 + r)^t \Rightarrow A(t) = A_0(1.0625)^t$

$2A_0 = A_0(1.0625)^t \Rightarrow 2 = (1.0625)^t$

$\ln 2 = \ln(1.0625)^t \Rightarrow \ln 2 = t \ln(1.0625) \Rightarrow t = \dfrac{\ln 2}{\ln 1.0625}$

$t \approx 11.433$ years

23. The number of bacteria in a petri dish culture after t hours is $B(t) = 100e^{0.693t}$.

a. What was the initial number of bacterial present?

$B(0) = 100e^{0.693(0)}$

$B(0) = 100e^0$

$B(0) = 100$

b. How many bacteria are present after 6 hours?

$B(6) = 100e^{0.693(6)}$

$B(6) \approx 6,394$ bacteria

c. Approximately when will the number of bacteria be 200? In other words, estimate the doubling time of the bacteria.

$200 = 100e^{0.693t}$

$2 = e^{0.693t}$

$\ln 2 = \ln(e^{0.693t})$

$\ln 2 = 0.693t$

$\dfrac{\ln 2}{0.693} = t$

$t \approx 1$ hour